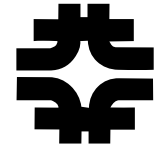


FNAL

Hugh Montgomery

Fermilab

April, 2006

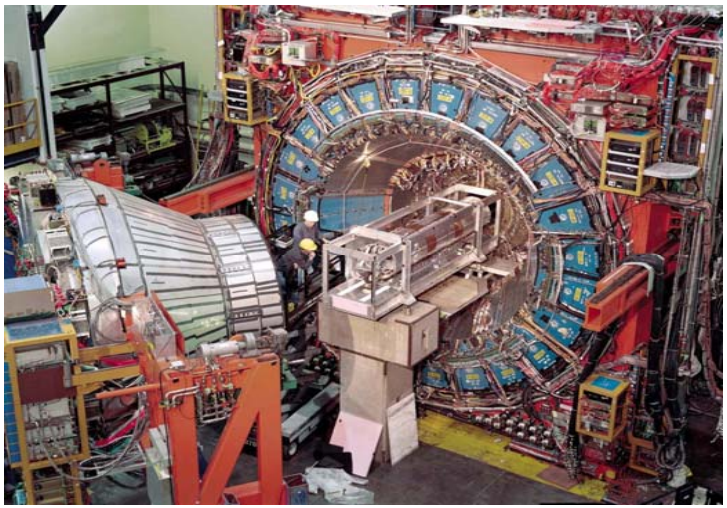
Organisation Issues

- Deputy Director Designate
  - Young Kee Kim
- Contract Bid/New Operating Contract for Fermilab)
  - URA/University of Chicago Limited Liability Company
    - Lab Management are “key personnel” in this bid.
    - Expect Request for Proposals soon
    - Short time to respond
- Passed on the PAC Meetings in Spring and in June

The outside world

- Operations Review (March 29-31)
  - Was limited to the accelerator (scant attention paid to the experiments)
- P5
  - Fermilab April 18-19
    - Fermilab Plan, Neutrinos, DUSEL, Dark Matter
  - SLAC April 20-21
    - BaBar, SLAC Plan, ILC, Dark Energy
- URA Visiting Committee
  - May 8,9
- Annual Program Review (May 15-18)

Tevatron Program



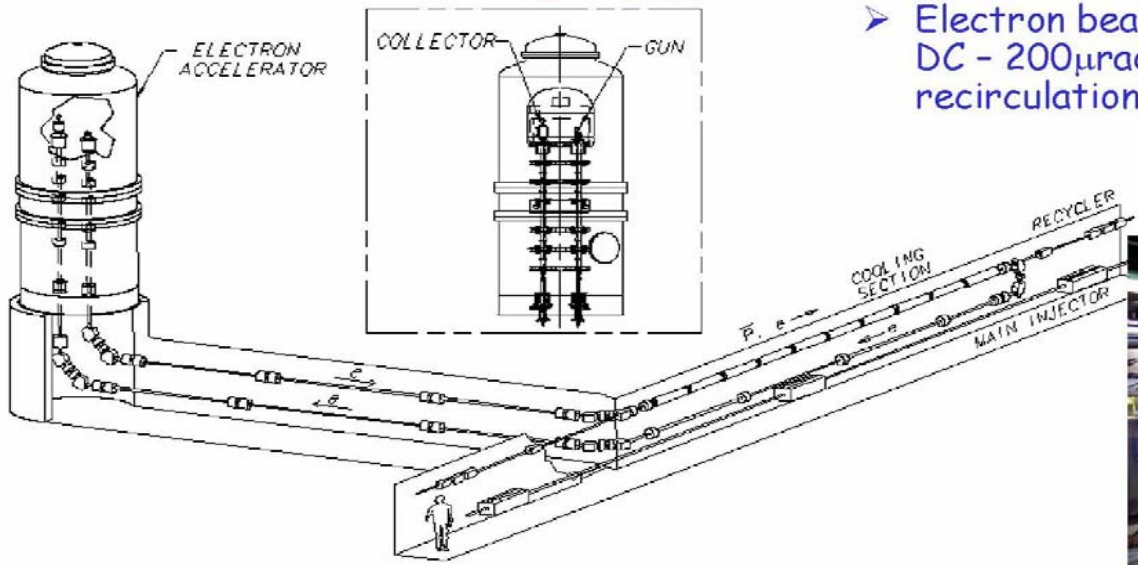
- Greatest window into new phenomena until LHC is on
- 1500 collaborators
  - 600 students + postdocs
- 1.3 fb^{-1} / experiment recorded
- Producing results with ~1fb^{-1}
  - within ~1 month of data taking
- Show only a few highlights

Recent technological success

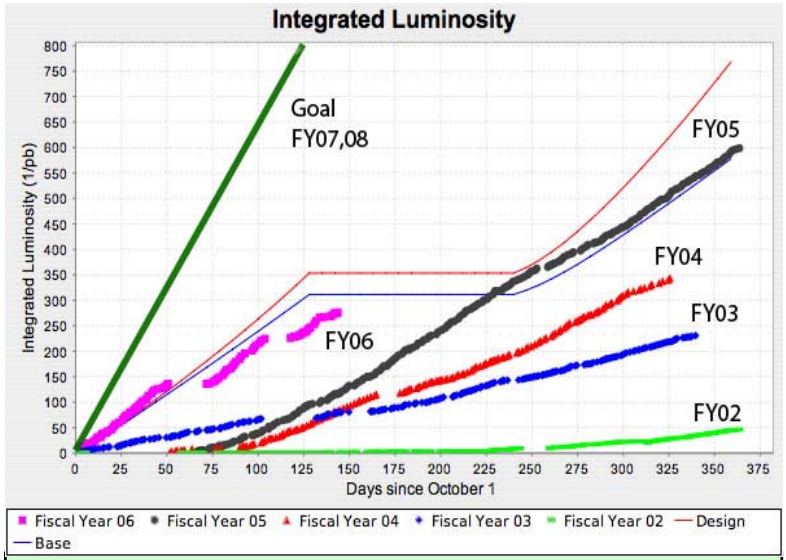
Fermilab
Accelerator Division

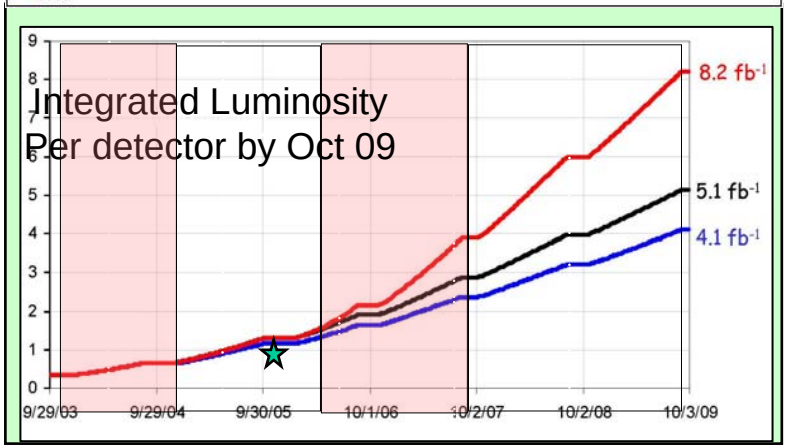
Recycler Electron Cooling

- The maximum antiproton stack size in the Recycler is limited by
  - Stacking Rate in the Debuncher-Accumulator at large stacks
  - Longitudinal cooling in the Recycler
- Longitudinal stochastic cooling of 8 GeV antiprotons in the Recycler is being replaced by Electron Cooling
  - Electron beam: 4.34 MeV – 0.5 Amps DC – 200μrad beam spread – 99% recirculation efficiency



Tevatron: key is luminosity





Luminosity history
for each fiscal year

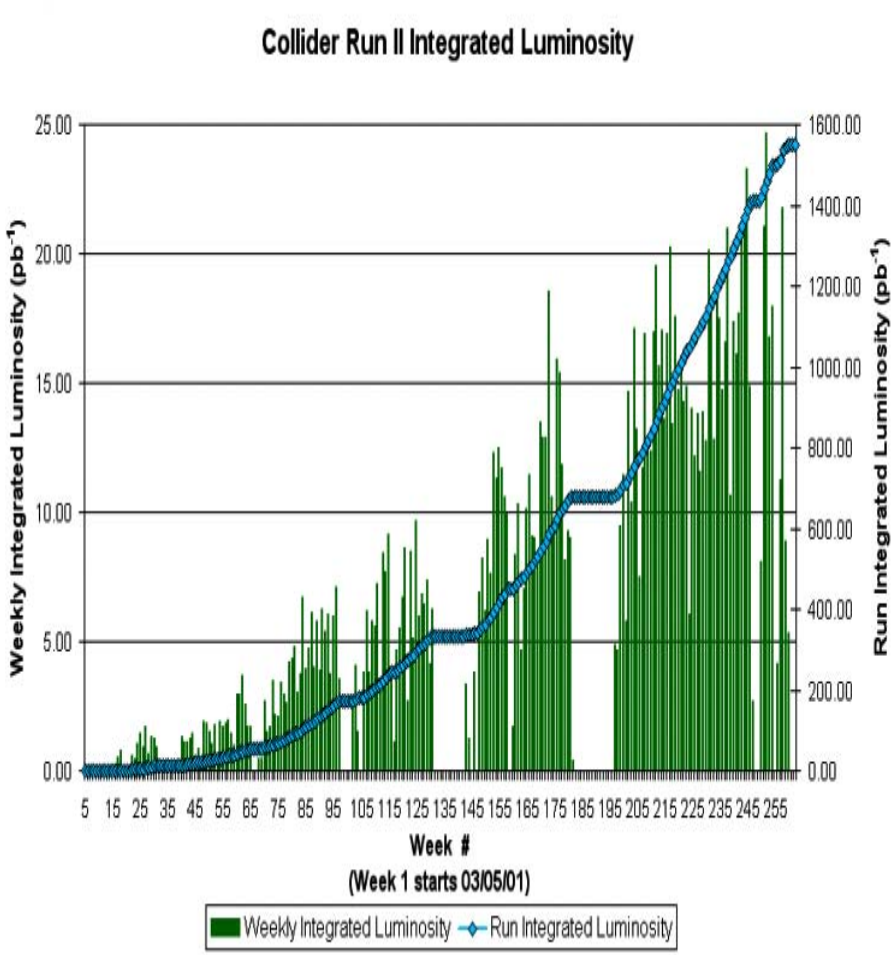
Integrated luminosity
for different assumptions

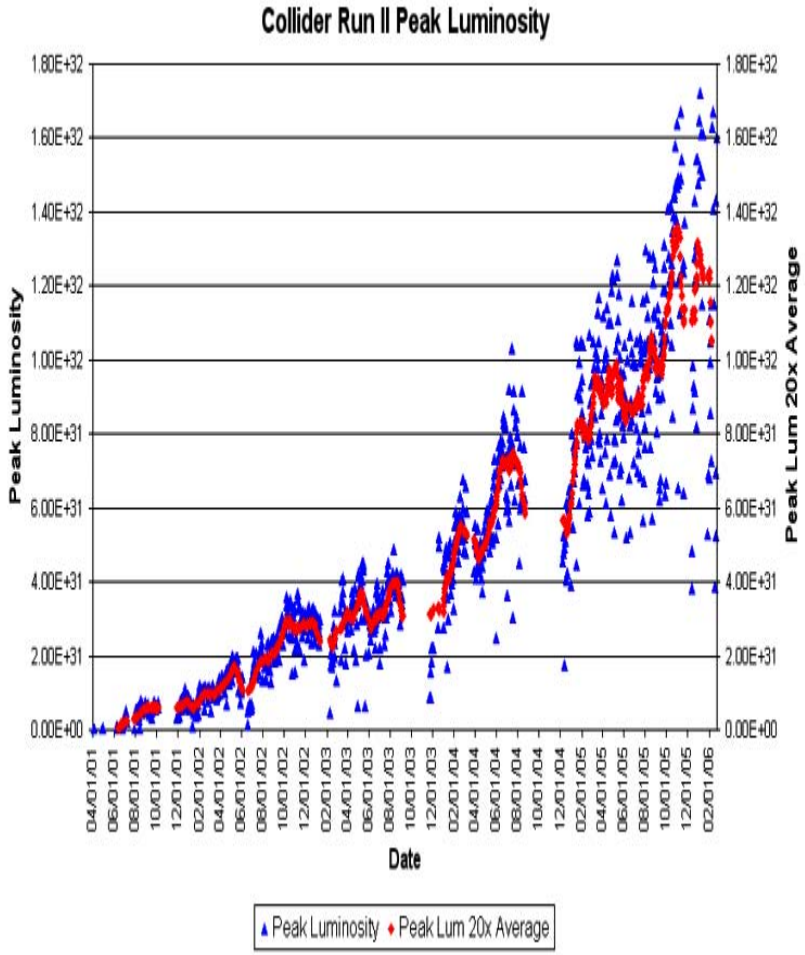
Red: 30 mA/hr pbar production

Black: is better base with 20 mA/hr established before shutdown

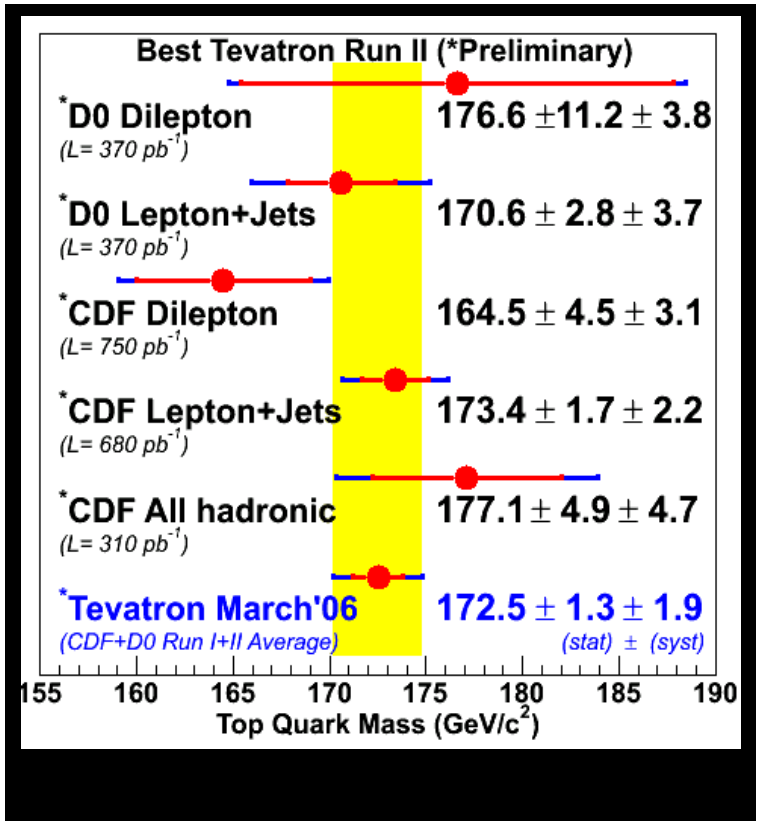
(pink/white bands show the doubling times for the top line)

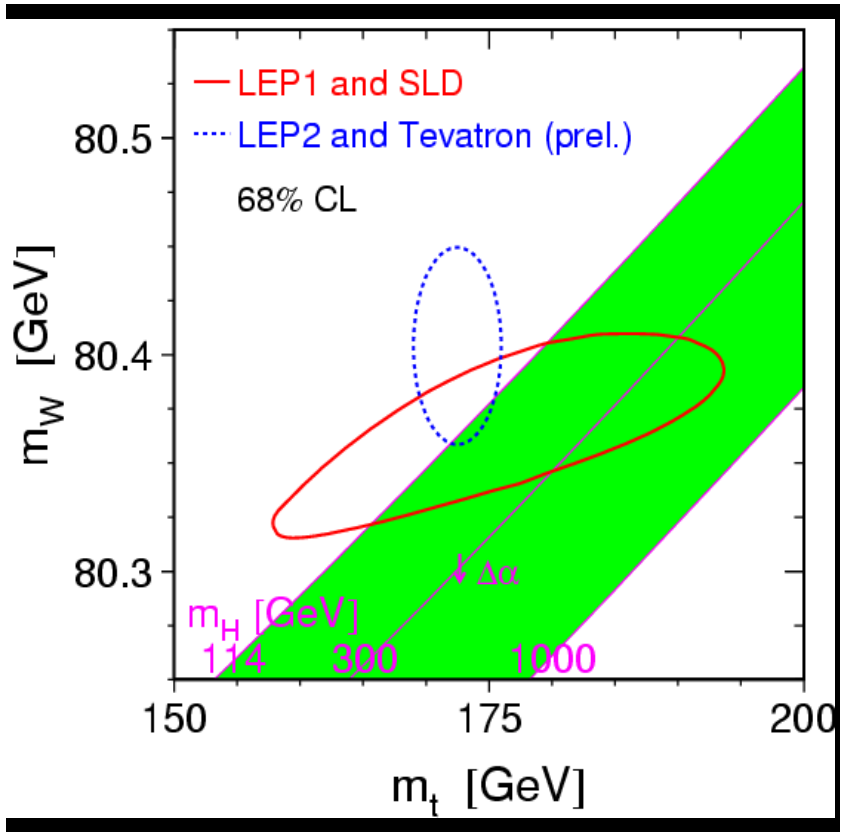
Tevatron Performance





Top Quark Mass Measurements

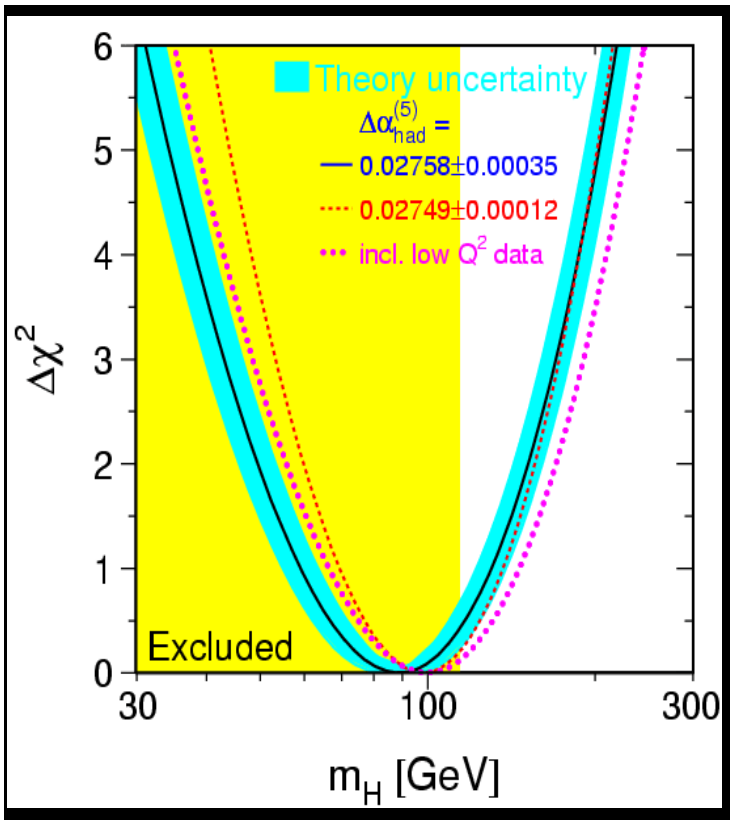


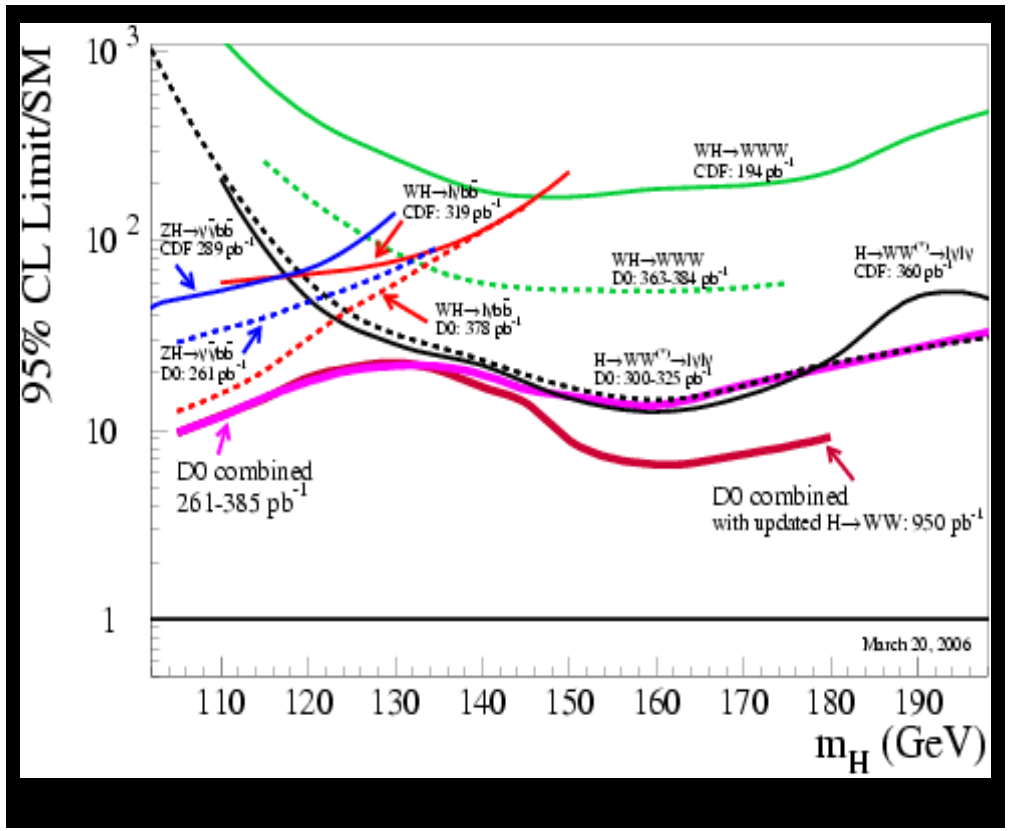


- δM_{top} = 2.3 GeV
  - x2 better than the Run I result
  - much better than expected - new ideas!
- Another x2 improvement by the end of Run II

Closing in on the the SM Higgs

Tevatron Run II Preliminary



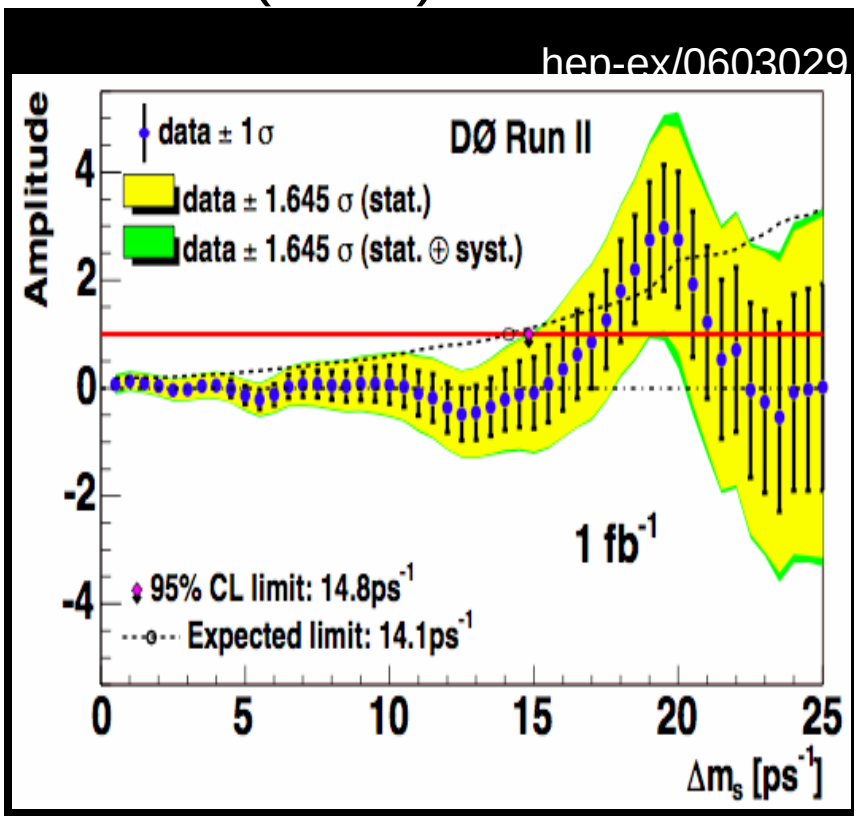


- Sensitivity to low mass Higgs, or
- Severely constrain mass

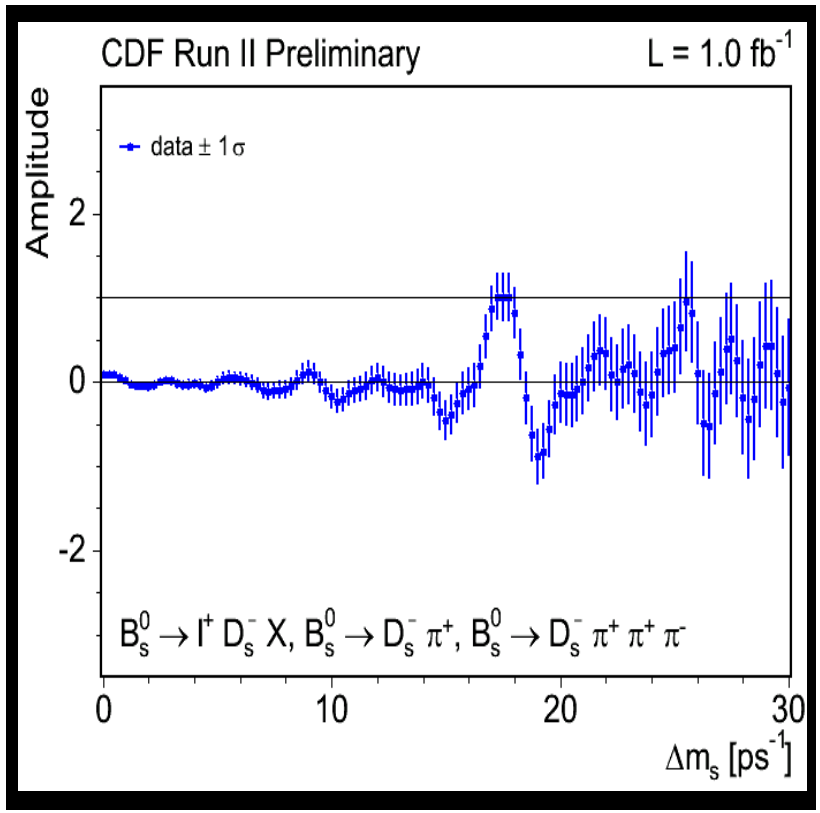
B_s Flavor Oscillation

World average $\Delta m_s > 14.4\ ps^{-1}$ (Summer 2005)

DØ (1 fb^{-1}) March 2006



CDF (1 fb^{-1}) April 2006

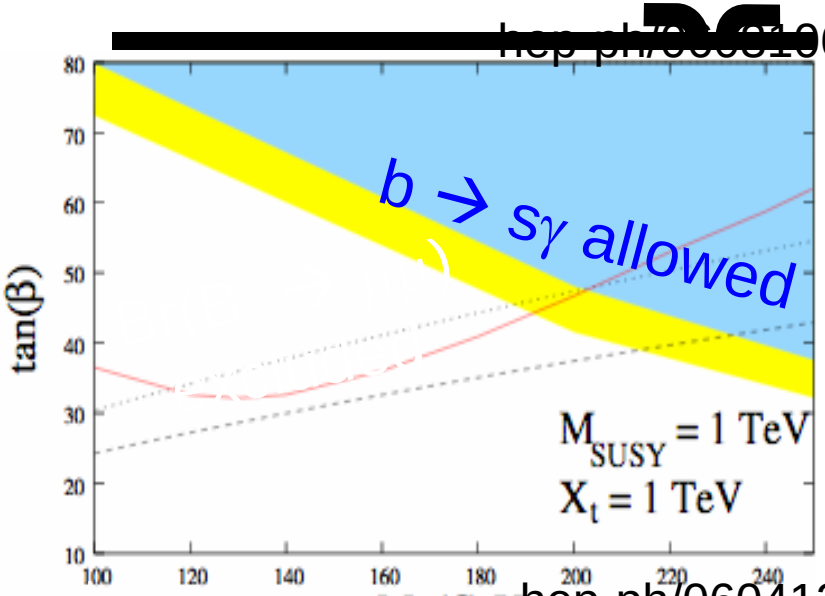


$17 < \Delta m_s < 21\ ps^{-1}$ at 90% CL $\quad \Delta m_s = 17.33\ ^{+0.42}_{-0.21} \pm 0.07\ ps^{-1}$

Windows to New Physics?!

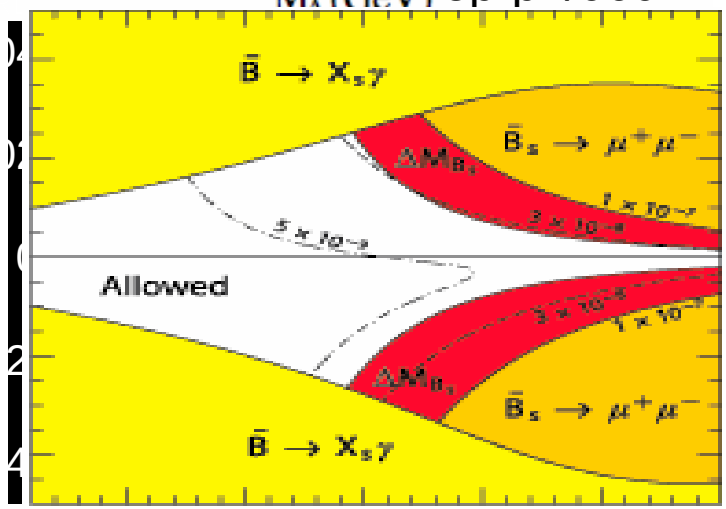
Many SUSY models predict significant flavor-changing effects

in rare decays of B_s mesons
and
in oscillation of B_s mesons

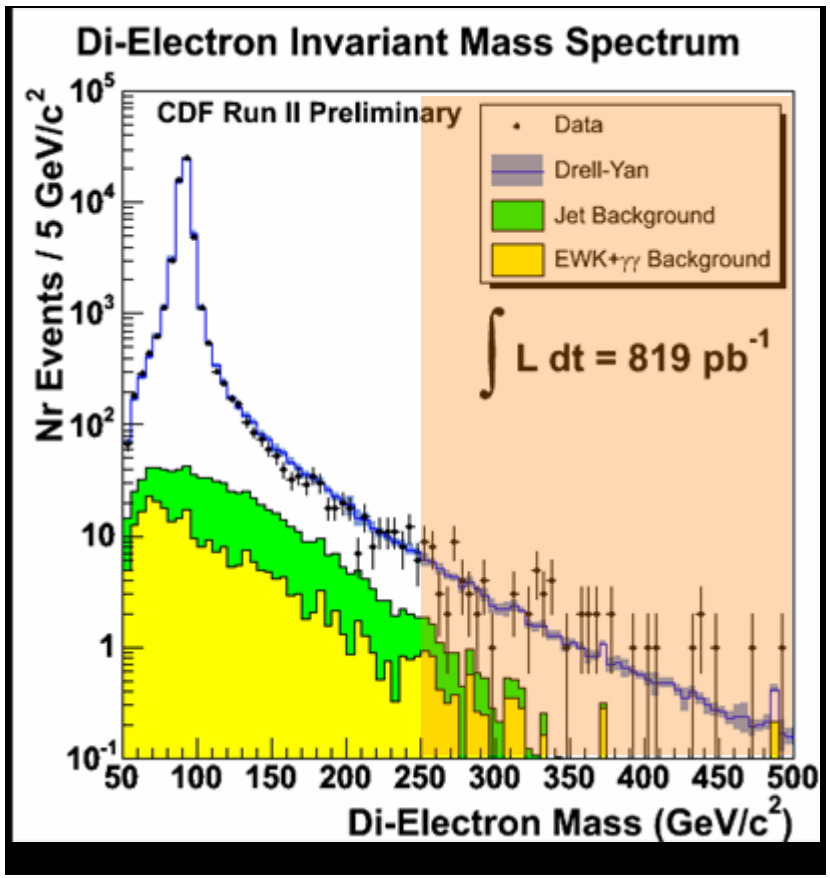


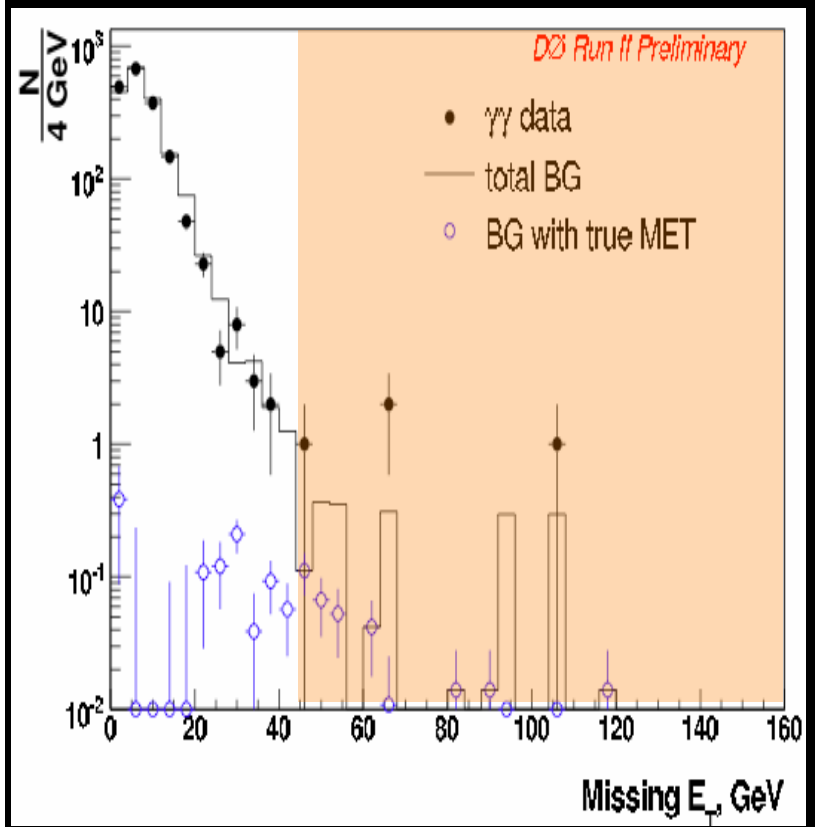
95% CL Branching Ratio Limits

Channel	CDF (0.8 fb^{-1})	DØ (0.3 fb^{-1})
$B_d \rightarrow \mu\mu$	3.0×10^{-8}	
$B_s \rightarrow \mu\mu$	1.0×10^{-7}	3.7×10^{-7}
$B_s \rightarrow \mu\mu\phi$		4.1×10^{-6}



Z', LED, SUSY(GMSB), ...



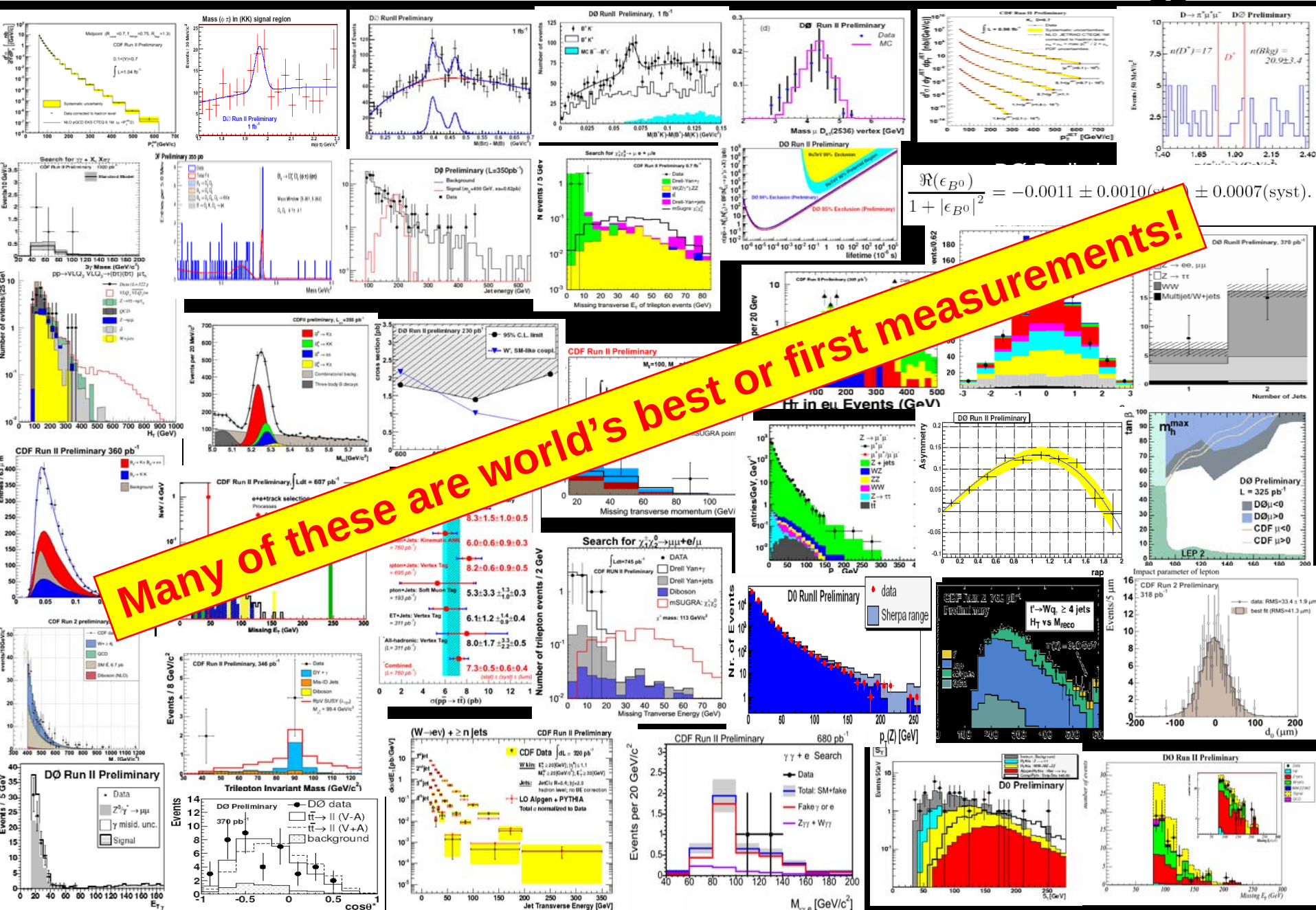


95% CL Excluded:

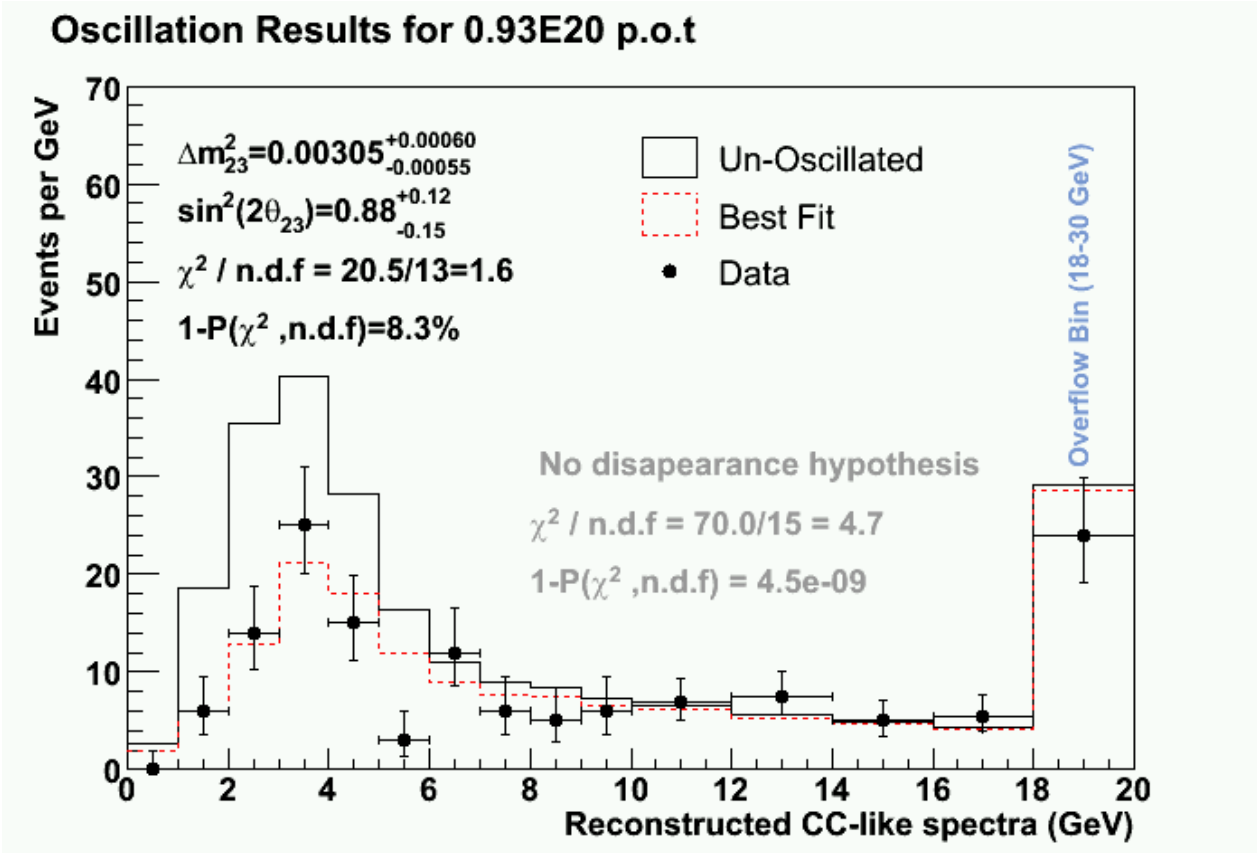
$M_{Z'} < 850$ GeV (Standard Model like Z')

$M(\chi_1^0) < 120$ GeV, $M(\chi_1^{\pm}) < 220$ GeV (Gauge-Mediated SB)

Other Results since September 2005

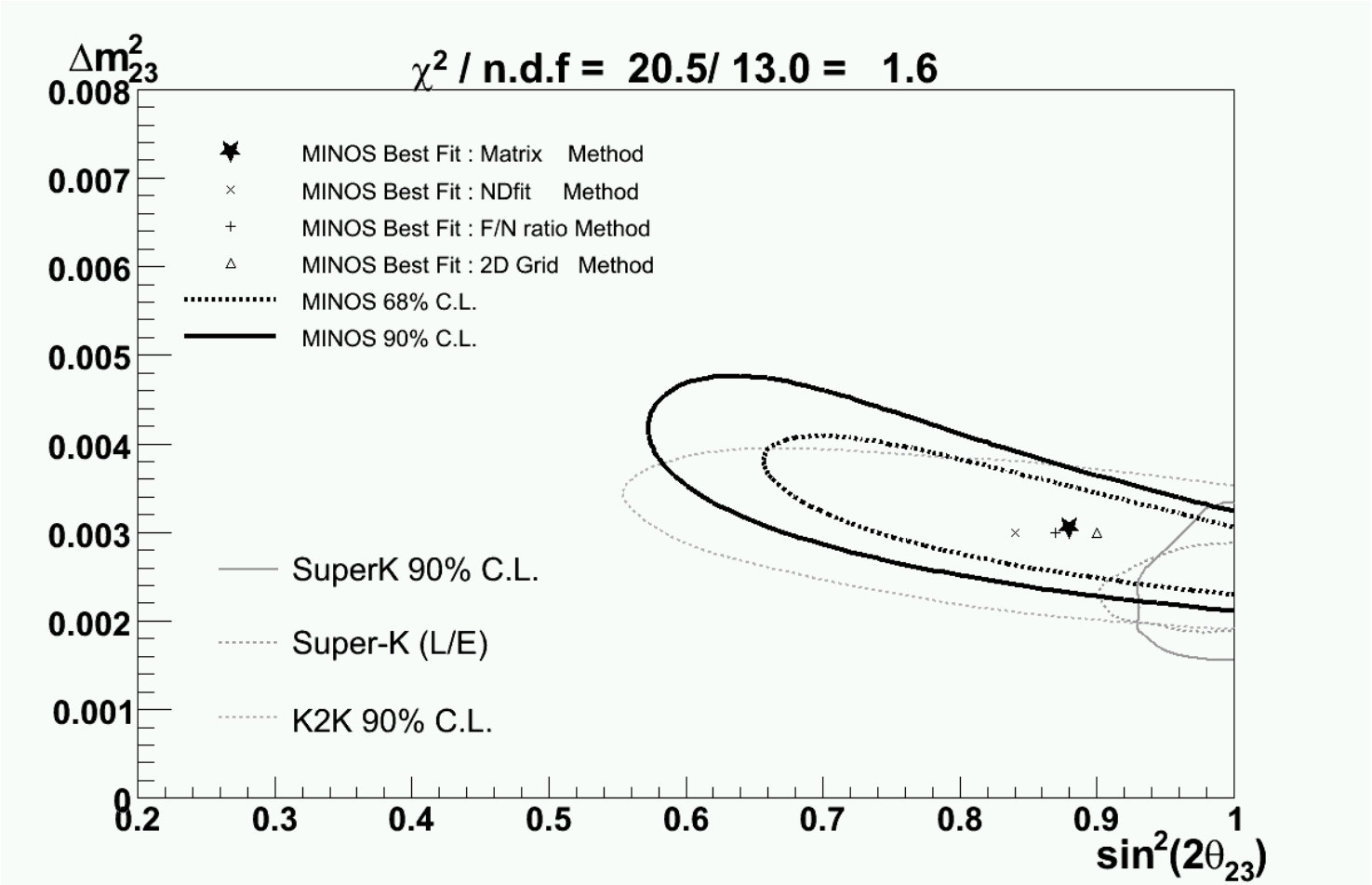


MINOS Result



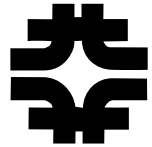
$$\chi^2(\Delta m^2, \sin^2 2\theta) = \sum_{i=1}^{nbins} 2(e_i - o_i) + 2o_i \ln(o_i / e_i)$$

MINOS Result



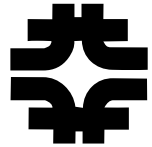
- The results of the four different extrapolation methods are in excellent agreement with each other.

Collider Experiment Task Force



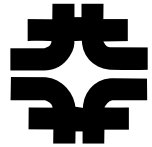
- Subgroup #1: Collaboration resources
  - Membership: Terry Wyatt and Rob Roser (co-chairs), Luciano Ristori, Pierre Petroff, Young-kee Kim, Gerry Blazey, and Chip Brock .
- Subgroup #2: Operations Requirements and resources
  - Membership: Willis Sakumoto and George Ginther (co-chairs) , Linda Stutte , Mike Lindgren, Rob Roser, Gerry Blazey, Joel Butler, Jim Strait
- Subgroup #3: Data Processing requirements and resources
  - Membership: Ashutosh Kotwal and Gavin Davies (co-chairs), Amber Boehnlein, Rick Snider , Young-Kee Kim , Terry Wyatt, Bob Tschirhart, Vicky White
- Subgroup #4: Physics Analysis requirements and issues
  -
  - Membership: Gerry Blazey and Young-Kee Kim (co-chairs), John Hobbs, Volker Buesher, Franco Bedeschi, Rob Roser, and Beate Heinemann.
- Task Force has made considerable progress.
  - Draft Report Submitted to Director

Collider Experiment Task Force



- Presentation of Task Force report to HEPAP
  - It was well received, that is you get some considerable credit for trying to manage the situation
- We are trying to work several of the recommendations
- Fermilab trying to establish a Fellowship Program
  - Being pushed by Young Kee in the international context
  - Discussions with Robin Thursday indicate he is very supportive of this initiative
    - Said he would try to find some money THIS year
      - (until now he has pointed to next year)
    - Said he would not be against domestic program as well
- We will try to launch so that you can get some respondents for the next academic year.

Conclusions



- Neutrino Program 1.4 10^{20} pot delivered,
  - result based on 0.9 10^{20} pot
  - Rest analysed for Neutrino '06??
  - Need to handle an issue with Tritium
- LHC Preparations coninue
  - CMS Silicon tracker assembly
  - CMS Forward Pixel
  - CMS LPC
- ILC has moved to the foreground
  - Lots of energy in the transition
- Past Year was very successful for the Collider experiments – we will hear more
- For the accelerator, the trick is to increase the anti proton production.
- Looking forward to the coming year and more